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DESCRIPTION

AUTOMATIC KEYWORD EXTRACTION APPARATUS,  
METHOD, RECORDING MEDIUM AND PROGRAM

TECHNICAL FIELD

The present invention relates to an apparatus, a method, a recording medium and a program which extracts a keyword automatically from title character string information and detailed character string information of contents such as EPG (Electronic Program Guide) information.

BACKGROUND ART

In a digital television broadcast which has got into full swing in recent years, EPG information including information designating a program title (title character string information), information explaining detail of the program (detailed character string information), information designating a genre of the program or the like is transmitted from the broadcast station together with video and audio data of the program. In a television receiver designed to have correspondence with the digital broadcast, it is possible to display an electronic program guide on a screen according to the EPG information.

Further, there is also an analog television broadcast in which such EPG information is transmitted.

In a case when a user searches a program he wants to watch, he utilizes this electronic program guide so as to search from a title, to search by reading detailed character string

information or the like after selecting a rough genre (for example, sport, drama or the like).

However, how to attach a title of a program has infinite variety, so that it is not always easy for a user to perform a search from a title. Also, detailed character string information of a program is described in the form of a sentence and it is not rare that numbers of pages are covered for this, so that it is troublesome for a user to search from the detailed character string information.

On the other hand, it becomes very easy for a user to search if a program search is made possible, for example, by using a keyword of a name of a professional entertainer or the like. However, a keyword is not included independently in EPG information transmitted from the broadcast station at present. Therefore, it becomes necessary to extract a keyword from the EPG information in order to make the search using a keyword possible.

Heretofore, there existed a method as an extraction method of the keyword in which a user appoints head and tail end words of a character string which are desired to be determined as a keyword within a sentence of a detailed character string information in an electronic program guide displayed on a television receive by means of a cursor or the like.

However, according to this conventional extraction method, a user himself should perform an operation for appointing a

keyword, so that it is complicated and at the same time, it is difficult to extract a large number of keywords in a short period of time.

On the other hand, a method called Japanese language morphological analysis is known as a general automatic keyword extraction method. However, according to this method causes, a program size and/or a dictionary size to be used becomes very large and at the same time, the CPU is to be subject to a large amount of loads. Consequently, it is extremely inefficient to use this method in home electric appliances such as a television receiver in which the throughput capacity or the memory capacity of the CPU is not so large.

Further, a method called a character type separation method is also known as a general automatic keyword extraction method. According to this method, a keyword is to be extracted by detecting differences of character types among Chinese character, Katakana, Hiragana, alphabet, numerical character and the like. However, it is not possible to perform an extraction of a keyword for searching a program accurately only according to this character type separation method. More specifically, with respect to a name of a professional entertainer which has Chinese character for his family name and Hiragana or Katakana for his first name (for example, such a name as "akari ISHIDA"), it is not possible to extract the whole name, because the family name and the first name are to be separated. Further, it is not

possible either to extract a foreigner's name whose first name is written in alphabet and family name is written in Katakana or a foreigner's name in which "." (midpoint) is inserted between his first and family names (for example, such a name as "B. Dooley"), because the family name and the first name are to be separated.

In view of the aforementioned aspect, the present invention was done according to a problem in which it becomes possible for a user to extract a keyword for searching the contents automatically, efficiently and moreover accurately from the title character string information and detailed character string information of contents such as EPG information even in home electric appliances in which the throughput capacity or the memory capacity of the CPU is not so large.

#### DISCLOSURE OF THE INVENTION

In order to solve this problem, the present applicant proposes an automatic keyword extraction apparatus which comprises first extraction means for performing an extraction of a keyword from title character string information of contents by using a first keyword dictionary in which a character string designating a sub-genre is registered; and a second extraction means for performing an extraction of a keyword from a detailed character string information of the contents by using a second keyword dictionary in which names of persons are registered and

for performing an extraction of a keyword by utilizing character type separation method.

In this automatic keyword extraction apparatus, a keyword is extracted from the title character string information of contents (for example, title character string information in EPG information in case of a television broadcast) by using a first keyword dictionary in which a character string designating a sub-genre is registered.

Also, a keyword is extracted from the detailed character string information of the contents (for example, detailed character string information in EPG information in case of television broadcast) by using the second keyword dictionary in which names of persons are registered and at the same time, a keyword extraction is also performed by utilizing the character type separation method. In this regard, a name of a person which has Chinese character for the family name and Hiragana or Katakana for the first name is also extracted as a keyword if it is a name of a person registered in the second keyword dictionary. Also, even a name of a person which is not registered in the second keyword dictionary is extracted as a keyword by utilizing the character type separation method.

As described above, a keyword can be extracted accurately using a small sized program or dictionary by carrying out the keyword extraction from the title character string information and the keyword extraction from the detailed character string

information with the help of keyword dictionaries different each other and a rule (whether or not character type separation method is utilized or the like) according to respective information.

In this manner, it becomes possible for a user to extract a keyword for searching the contents automatically, efficiently and moreover accurately from the title character string information and detailed character string information of the contents such as EPG information even in home electric appliances in which the throughput capacity or the memory capacity of the CPU is not so large.

It should be noted in this automatic keyword extraction apparatus that it is preferable, as one example, for the first extraction means to extract a keyword from a portion excluding a character string registered in a predetermined character string dictionary for exclusion within a title character string including a character string registered in a first keyword dictionary.

In this manner, it becomes possible for a user to extract a keyword for searching contents from the title character string information and detailed character string information of contents such as EPG information automatically, efficiently and moreover accurately even in home electric appliances in which the throughput capacity or the memory capacity of the CPU is not so large.

Further, a first extraction means, as one example, in this automatic keyword extraction apparatus preferably extracts a character string separated by a special character other than Hiragana, Katakana, Chinese character, numerical character and alphabet as a keyword within a title character string including a character string registered in a first keyword dictionary.

In this manner, with respect to a title which is not separated by such a special character, the title itself is to be extracted as a keyword in a form as it is by avoiding a plurality of character strings included in the title from being extracted as a separated keyword.

The title which is not separated by such a special character is not useful so much as a keyword for searching contents, because the individual character string included in the title has an extremely broad meaning (because the search result has an extremely large amount of volumes) and it is often the case that the title itself becomes useful as a keyword for an efficient search of contents for the first time. Consequently, it becomes possible for a user to search contents still more effectively by using an extracted keyword (title itself).

Also on the other hand, with respect to a title separated a special character, an individual character string separated by a special character is to be extracted as each keyword.

With respect to a title separated by a special character (for example, a space, "x" or the like), each individual

character string separated by a special character becomes useful as a keyword for searching contents and it is often the case that the title itself is too restricted to be useful as a keyword for searching contents (search result becomes zero or very few). Consequently, it also becomes possible for a user to search contents still more effectively by using an extracted keyword (individual character string separated by a special character).

Further, a second extraction means, as one example, in this automatic keyword extraction apparatus preferably performs an extraction of a keyword by utilizing a character type separation method from a portion excluding a character string registered in a predetermined character string dictionary for exclusion within a remaining portion of a detailed character string information whose keyword is extracted by using a second keyword dictionary.

In this manner, it is possible to prevent a character string which is within character strings included in detailed character string information and is inappropriate for searching contents from being included in keywords. Consequently, it becomes possible for a user to search contents still more effectively by using extract keywords.

Further, a second extraction means, as one example, in this automatic keyword extraction apparatus preferably treats Katakana and alphabet as the same character type while utilizing a character type separation method and at the same time, treats



"." (midpoint) as Katakana and alphabet in a case when letters just before is Katakana and alphabet respectively.

In this manner, it becomes possible to extract a foreigner's name in which his first name is written in alphabet and his family name is written in Katakana or a foreigner's name in which "." (midpoint) is inserted between his first name and family name as a keyword.

Further, it is preferable in this automatic keyword extraction apparatus that means for downloading the second keyword dictionary via a network is further comprised, wherein the second extraction means uses the downloaded second keyword dictionary.

In this manner, it becomes possible to extract a keyword by using the newest dictionary (dictionary in which a name of a person who became famous just recently is also registered) as the second keyword dictionary.

Next, the present applicant proposes an automatic keyword extraction method which comprises a first step for performing an extraction of a keyword from title character string information of contents by using a first keyword dictionary in which a character string designating a sub-genre is registered; and a second step for performing an extraction of a keyword from detailed character string information of the contents by using a second keyword dictionary in which names of persons are

registered and for performing an extraction of a keyword by utilizing character type separation method.

Also, in a program of an automatic keyword extraction apparatus, a recording medium recorded with a program which can be read by a computer is proposed, wherein the program comprises first extracting step for performing an extraction of a keyword from title character string information of contents by using a first keyword dictionary in which a character string designating a sub-genre is registered; and a second extracting step for performing an extraction of a keyword from detailed character string information of the contents by using a second keyword dictionary in which names of persons are registered and for performing an extraction of a keyword by utilizing character type separation method.

Also, a program is proposed wherein the program makes a computer which controls an automatic keyword extraction apparatus execute a first extracting step for performing an extraction of a keyword from title character string information of contents by using a first keyword dictionary in which a character string designating a sub-genre is registered; and a second extracting step for performing an extraction of a keyword from detailed character string information of the contents by using a second keyword dictionary in which names of persons are registered and for performing an extraction of a keyword by utilizing character type separation method.

According to the automatic keyword extraction method, the recording medium or the program, it becomes possible for a user to extract a keyword for searching contents automatically, efficiently and moreover accurately from title character string information and detailed character string information of contents such as EPG information even in home electric appliances in which the throughput capacity or the memory capacity of the CPU is not so large just similarly as explained for the automatic keyword extraction apparatus relating to the aforementioned present invention.

#### BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a diagram showing an outline of a digital television broadcast receiving system which includes a program recording and reproducing apparatus applied with the present invention;

FIG. 2 is a block diagram showing a hardware constitution of the program recording and reproducing apparatus of FIG. 1;

FIG. 3 is a flowchart showing an automatic keyword extraction process executed by a CPU in FIG. 2;

FIG. 4 is a flowchart showing an automatic keyword extraction process executed by a CPU in FIG. 2;

FIG. 5 a diagram showing a rule for extracting a keyword in a process of FIG. 3;

FIG. 6 a diagram showing a rule for extracting a keyword in a process of FIG. 4; and

FIG. 7a block diagram showing a hardware constitution of a program recording and reproducing apparatus for an analog television broadcast applied with the present invention.

#### BEST MODE FOR PERFORMING THE INVENTION

Hereinafter, an example applied with the present invention in an apparatus which records and reproduces a program of a digital television broadcast will be explained by using drawings.

FIG. 1 is a diagram showing an outline of a digital television broadcast receiving system which includes a program recording and reproducing apparatus applied with the present invention. A digital transmission signal transmitted from a television broadcast station is received by an antenna 1 and inputted to a program recording and reproducing apparatus 2. The program recording and reproducing apparatus 2 is connected to a display apparatus 3 which includes a display and a speaker and at the same time connected to an internet 4.

FIG. 2 is a block diagram showing a hardware constitution of the program recording and reproducing apparatus 2. In the program recording and reproducing apparatus 2, a tuner 11, a demodulator 12, a descrambler 13 and a multiplex separator 14 are serially connected in this order and at the same time, with respect to the multiplex separator, a video decoder 15 and a video signal processing circuit 17 and in addition an audio decoder 16 and a D/A converter 18 are connected respectively in these orders.

Also, the tuner 11 to the D/A converter 18, a CPU 19, a ROM 20, a main memory (RAM) 21, a flash memory 22, an interface 23 for a remote controller, an interface 24 for an HDD (hard disk drive) and a communication interface 25 for an internet connection are connected one another by means of a system bus 26. An HDD (hard disk drive) 27 for picture-recording a television program is connected to the interface 24.

In a remote controller (hereinafter referred to as REMOCON) 28 attached to the program recording and reproducing apparatus 2, various kinds of operation buttons (a power supply button, a channel selection button, a picture-record reservation button, a playback button, a direction key for performing a selection on an EPG on the screen, a determination key and the like) same as those in a REMOCON attached to a television receiver for a normal digital broadcast are provided.

When the television program is viewed and listened, the digital transmission signal inputted to the program recording and reproducing apparatus 2 is selected in frequency band by the tuner 11 according to a channel selection operation of the REMOCON 28 and thereafter is demodulated in the demodulator 12 and descrambled in the descrambler 13, and thereafter is separated in the multiplex separator 14 into video and audio data packets of the program for multiple channels, into EPG information packets and the like.

The video and audio data packets for one channel extracted

from the video and audio packets of the television program for multiple channels according to a channel selection operation of the REMOCON 28 are transmitted decoded to an MPEG-2Video and an MPEG-2Audio by the video decoder 15 and audio decoder 16 respectively. Also, the EPG information packets are transmitted to the CPU 19.

Then, the video signal decoded in the video decoder 15 and an video signal for the electronic program guide display produced in the CPU 19 by using the EPG information are applied with a conversion to the NTSC system in the video signal processing circuit 17, mixing or the like and outputted from a video output terminal 29 so as to be transmitted to the display apparatus 3 of FIG. 1.

Also, the audio signal decoded in the audio decoder 16 is analog-converted in the D/A converter 18 and outputted from an audio output terminal 30 so as to be transmitted to the display apparatus 3 of FIG. 1.

The CPU 19 controls the whole program recording and reproducing apparatus 2 according to programs and data stored in the ROM 20 by using the main memory 21 as a working memory.

In the processes performed by the CPU 19, there is an automatic keyword extraction process other than a process when viewing and listening to a television program according to a channel selection operation of the REMOCON 28 and a picture-recording process of the television program to the HDD 27

according to a picture-record reservation operation of the REMOCON 28.

In the ROM 20, a keyword dictionary for titles, an excluded character string dictionary for titles, a keyword dictionary for detailed information and an excluded character string dictionary for detailed information are stored as dictionaries to be used for that automatic keyword extraction process.

In the keyword dictionary for titles, there are registered character strings showing sub-genre (more detailed genre than a rough genre such as "sport" by the genre information in the EPG information) such as "professional baseball", "golf", "soccer", "hot spring", "GO", "Japanese chess", "movie" or the like; character strings such as "passionate love" and "love"; and effective and moreover important character strings for searching a program within character strings which are often included in program titles such as character strings of baseball club names of the professional baseball.

In the excluded character string dictionary for titles, there are registered extremely general character strings as keywords for searching programs within character strings included in program titles such as "movie", "BS", symbols unique in the program table (for example, a symbol of N surrounded by a square frame for designating a news program).

In the keyword dictionary for detailed information, there are respectively registered character strings of names written

in only Hiragana, in a combination of Hiragana and Chinese character, in a combination of Hiragana and Katakana, in a combination of Chinese character and Katakana, in only Chinese character of equal to or less than 2 letters and in only Chinese character of equal to or more than 6 letters within names of famous people (professional entertainers, athletes, politicians, cultural figures or the like) who often appear in television programs. Also, in the keyword dictionary for detailed information, there are registered also character strings other than names of persons which are proper character strings as keywords for searching programs within character strings which are often included in detailed character string information in EPG information such as, for example, "hot spring".

In the excluded character string dictionary for detailed information, there are registered character strings inappropriate as keywords for searching programs within character strings which are often included in detailed character string information in EPG information such as "guest", "ended" and "manager".

It should be noted relating to a keyword dictionary of detailed information that the CPU 19 downloads the newest one (one registered with names of persons who became famous just recently or the like) from an exclusive site via internet and stores it also in the flash memory 22.

Also, CPU 19 stores EPG information packets which are



transmitted from the multiplex separator 14 on a channel selection operation of a user or on a picture recording according to a picture-record reservation operation of a user into the flash memory 22 on the assumption that an automatic keyword extraction process is carried out.

FIGS. 3 and 4 are flowcharts respectively showing automatic keyword extraction processed executed by the CPU 19.

FIG. 3 therein shows a process for extracting a keyword from title character string information, wherein title character string information is first picked up from EPG information stored in the flash memory 22 (step S1).

Subsequently, character strings registered in a keyword dictionary for titles (character strings showing sub-genres such as "golf", "soccer", "hot spring", "GO", "Japanese chess", "movie" or the like) are searched from a plurality of program titles which the title character string information shows. Then, the whole title character strings in which character strings registered in the keyword dictionary for titles are included within these program titles are made to be a keyword extraction objective (step S2).

Subsequently, portions of character strings ("movie", "BS" or the like ) which are registered in an excluded character string dictionary for titles within titles which are made to be a keyword extraction objective in step S2 are substituted by spaces (step S3).

Subsequently, a keyword is extracted from the title character strings which went through step according to an extraction rule of titles such as shown in FIG. 5 (step S4).

According to the extraction rule for the titles, the title character string is extracted as a keyword as it is in a case when the title character string is not separated by a special character (space, X , 「」 or the like) other than characters of Hiragana, Katakana, Chinese character, numerical character and alphabet. On the other hand, in a case when the title character string is separated by such a special character, character strings of equal to or more than 2 letters are extracted as keywords respectively within respective character strings separated by the special character.

However, " . " (midpoint) is not treated as a special character. Then, in a case when there exists a " . " (midpoint) at the head or at the tail end of the character string extracted as a keyword, a portion excluding the " . " (midpoint) is made to be a keyword.

Finally, the keywords extracted in step S4 are stored in the flash memory 22 as a keyword list the title character string information (step S5).

Next, FIG. 4 is a process for extracting a keyword from detailed character string information and first, detailed character string information is picked up from EPG information

stored in the flash memory 22 (step S11).

Subsequently, a character string (famous person's name or the like) registered in the keyword dictionary for detailed information is searched from that detailed character string information. Then, a character string registered in the keyword dictionary for the detail information is extracted as a keyword within the detailed character string information and at the same time, the portion of the character string is substituted by a half size space (step S12).

Subsequently, the portions of character strings ("guest", "ended", "manager" or the like) which are registered in an excluded character string dictionary for detailed information and are within the character strings of detailed character string information which went through step S12 are substituted by half size spaces (step S13).

Subsequently, a keyword is extracted from the character strings of detailed character string information which went through step S13 according to an extraction rule of the detailed character string information such as shown in FIG. 6 (step S14).

According to the extraction rule for the detailed character string information, a character type separation method which separates Hiragana, Katakana, Chinese character, numerical character, alphabet and other character-type letters to one another is basically utilized.

However, Katakana and alphabet are treated as same

character types (not separated). Also, "·" (midpoint) is treated as Katakana and alphabet in a case when the letter just before it are Katakana and alphabet respectively (not separated).

Then, character strings excluding character strings composed of only Hiragana, character strings composed of only Chinese character equal to or less than 2 letters and character strings of only Chinese character equal to or more than 6 letters are extracted as keywords within the separated respective character strings respectively. However, a portion excluding "·" (midpoint) is made as a keyword in a case when "·" (midpoint) exists at the head or at the tail end of a character string extracted as a keyword.

Finally, keywords extracted in step S12 and keywords extracted in step S14 are stored in the flash memory 22 as a list of keywords in the detailed character string information (step S15).

Next, an aspect where a keyword for a program search is extracted in the program recording and reproducing apparatus 2 will be explained by citing an embodiment.

It is assumed that titles such as, for example, shown next are included within the title character string information in the EPG information which is transmitted from the multiplex separator 14 in case of a channel selection operation of a user or in case of a picture recording according to a picture-record

reservation operation of a user and is stored in the flash memory 22 (here, □□ and △△ designate professional baseball team-names).

Much ado about nothing of love

professional baseball relay broadcast □□ X △△

BS movie 「space·wars」

Then, since character strings called "love", "professional baseball" and "movie" are registered in the keyword dictionary for titles in the process of FIG. 3, the whole character strings of the titles become extraction objectives of keywords in step S2 respectively with respect to these respective titles.

Then, with respect to the BS movie 「space·wars」 within these titles, the portion "BS" and the portion "movie" are substituted by spaces in step S3.

Also, with respect to the professional baseball relay broadcast □□ X △△ within these titles, a space (particular symbol) exists between "professional baseball relay broadcast" and "□□" and X (particular symbol) also exists between "□□" and "△△", so that character strings "professional baseball relay broadcast", "□□", and "△△" are extracted as keywords in step S4 respectively.

Also, with respect to 「space·wars」 within these titles where portions of "BS" and "movie" are substituted by spaces, it is

separated by 「」 (particular symbol) and "·" (midpoint) is not handled as a particular symbol either, so that "space·wars" which is the title itself of the original movie is extracted as a keyword in step S4.

Also, "Much ado about nothing of love" within these titles is not separated by a particular symbol, so that "Much ado about nothing of love" which is the title itself is extracted as a keyword in step S4.

Consequently, character strings shown in below are stored in the flash memory 22 in step S5 as keywords for the program search (as mentioned above, □□ and △△ are professional baseball team-names).

Much ado about nothing of love

Professional baseball relay broadcast

□□

△△

Space·wars

In this manner, with respect to titles such as "Much ado about nothing of love" and "space·wars" which are not separated by special characters, the titles themselves are extracted according the process of FIG. 3 as keywords in a form as they are with a situation where a plurality of character strings included in the titles are not extracted as random keywords.

The title which is not separated by such a special

character is not useful so much as a keyword for a program search, because an individual character string of "love", "space" or the like included in the title has an extremely broad meaning (search result becomes very many) and it is often the case that the title itself is useful for the first time as a keyword for an efficient program search. Consequently, it becomes possible for a user to search a program efficiently by using the extracted keyword (title itself).

In addition, with respect to the title character string of a movie called "space.wars", a character string such as "BS" and "movie" which were added to the title for the title character string information and are too general for a program search is not included in the keyword and at the same time, "[ ]" which surrounded the title for the title character string information is not included in the keyword either. Consequently, it becomes possible for a user to search a program efficiently.

On the other hand, with respect to the titles such as "professional baseball relay broadcast □ □ X △ △" which are separated by special characters (space, "x", etc.), "professional baseball relay broadcast", "□ □" and "△ △" which are individual character strings separated by special characters are extracted as keywords respectively according to the process of FIG. 3.

With respect to the title which is separated by such

special characters, individual character strings separated by the special characters are useful as keywords for the program search respectively and it is often the case that the title itself is not so useful as a keyword for the program search, because is too restricted (search result becomes zero or very few, because the title changes to another when the adversary team (concrete name such as "□□" and "△△") becomes different). Consequently, it also becomes possible for a user to search a program efficiently by using the extracted keyword (individual character strings separated by special characters).

On the other hand, according to a process of FIG. 4, names or the like of famous people (chairman of program "Much ado about nothing of love" and a guest thereof and an actor who takes part in a movie "space.wars") which are registered in the keyword dictionary for detailed information are extracted as keywords in step S12 from the detailed character string information of the programs having these titles in the EPG information stored in the flash memory 22.

In this regard, names of famous people who have Chinese character for their family names and Hiragana or Katakana for their first names (for example, name of *akari* ISHIDA) are also registered in the keyword dictionary for the detail information, so that the names of such famous people are also extracted as keywords.



Also, a name of a person who became famous just recently is also extracted as a keyword, because the newest keyword dictionary for the detail information downloaded via internet is also used.

Also, the portions of the names or the like of the famous people and the portions of character strings ("guest", "ended", "manager" or the like) which are registered in an excluded character string dictionary for detailed information, within the character strings of detailed character string information, are substituted by half size spaces in step S12 and S13.

Then, a keyword is extracted in step S14 from the character strings of detailed character string information whose spaces were substituted according to an extraction rule shown in FIG. 6.

In this regard, Katakana and alphabet are handled as the same character type and at the same time, "." (midpoint) is handled as Katakana and alphabet in a case when a letter just before it is Katakana and alphabet respectively, so that a foreigner's name in which "." (midpoint) is inserted between his first and family names (for example, "B·Dooley") can be also extracted as a keyword.

Also, a name of a person which is not registered in the newest keyword dictionary for the detail information yet (for example, obscure professional entertainer who just debuted) can be extracted as a keyword unless it is a name composed of only

Hiragana, a name composed of only Chinese character equal to or less than 2 letters or a name composed of only Chinese character equal to or more than 6 letters (more specifically, unless it is a name which is not much likely to be as a name of a person).

Also, character strings such as "guest", "ended" and "manager" which are inappropriate character strings for the program search are never extracted as a keyword, because they received the space substitution.

In this manner, in step S15, a name of a famous person who has Chinese character for his family name and Hiragana or Katakana for his first name, a name of a person who became famous just recently, a foreigner's name whose first name is written in alphabet and family name is written in Katakana and a foreigner's name in which "." (midpoint) is inserted between his first and family names are also stored in the flash memory 22 as keywords for the program search. Consequently, it becomes possible for a user to search a program efficient by using the extracted keyword.

It should be noted for a method where a user uses the keywords stored in the flash memory 22 by the processes of FIGS. 3 and 4 for the program search that a proper method can be applied such that the CPU 19 produces, for example, according to a predetermined operation of the REMOCON 28, a video signal of a picture screen for the program search (picture screen for displaying keywords in a list and also for a user to select

desired keywords therein so as to instruct a search) and transmits it to the display apparatus 3 by way of the video signal processing circuit 17 and the video output terminal 29.

As mentioned above, it is constituted in the program recording and reproducing apparatus 2 such that a keyword can be extracted accurately using a small sized program or dictionary by carrying out the keyword extraction from the title character string information in the EPG information and the keyword extraction from the detailed character string information with the help of keyword dictionaries different each other and a rule according to respective information.

In this manner, it is constituted such that a user can extract a keyword for searching a program from the title character string information and detailed character string information in the EPG information automatically, efficiently and moreover accurately even though the throughput capacity or the memory (ROM 20, flash memory 22 or the like) capacity of the CPU 19 is not so large.

It should be noted in the above examples that the present invention is applied to an apparatus which records and reproduces a program of a digital television broadcast. However, the present invention is not restricted by this and it is needless to say that the present invention can be also applied to a program recording and reproducing apparatus which records and reproduces a program of an analog television broadcast.

FIG. 7a block diagram showing a hardware constitution of a program recording and reproducing apparatus for an analog television broadcast applied with the present invention. A video and an audio signal in an analog transmission signal which are received by an antenna 31 and inputted to a program recording and reproducing apparatus 41 is selected by a tuner 42 for a frequency band and encoded by an MPEG encoder 43.

When viewing and listening to a television program, this encode video and audio data are decoded by an MPEG decoder 47 and transmitted to a display apparatus 61 by way of a program recording and reproducing apparatus 41.

On the other hand, when recording the television program, the video and audio data encoded by the MPEG encoder 43 are transmitted to a main storage device 45 through a bus 44 so as to be recorded in the main storage device 45.

Then, when reproducing, video and audio data read out from the main storage device 45 are transmitted to the MPEG decoder 47 through the bus 44, decoded in the MPEG decoder 47 and transmitted to the display apparatus 61 by way of the program recording and reproducing apparatus 41.

Also, in an EPG obtaining module 46, EPG information is obtained from an analog transmission signal which is selected in a frequency band by the tuner 42. This EPG information is also transmitted to the main storage device 45 through the bus 44 and stored in the main storage device 45.

Also, a communication interface 48, a ROM 49, a main storage device 50, an auxiliary storage device 51 and an MPEG decoder 47 for being connected with an internet 71 are connected to a bus 52 respectively.

Also in this program recording and reproducing apparatus 41, the keyword dictionary for titles, the excluded character string dictionary for titles and the keyword dictionary for and the excluded character string dictionary detailed information as mentioned above are stored in the ROM 49 (relating to a keyword dictionary for detailed information, the newest is one downloaded from an exclusive site via internet and stored also in the flash memory 51) and at the same time, a CPU 53 which controls the whole program recording and reproducing apparatus 41 performs an automatic keyword extraction process same as that in FIG. 3 and FIG. 4 by using these dictionaries and the EPG information in the main storage device 45, and the extracted keywords are stored in the auxiliary storage device 51.

It is constituted also in this program recording and reproducing apparatus 41 quite similarly as that explained with respect to the program recording and reproducing apparatus 2 of FIGS. 1 and 2 such that a keyword can be extracted accurately using a small sized program or dictionary by carrying out the keyword extraction from the title character string information in the EPG information and the keyword extraction from the detailed character string information with the help of keyword

dictionaries different each other and a rule according to respective information.

In this manner, it is constituted such that a user can extract a keyword for searching a program from the title character string information and detailed character string information in the EPG information automatically, efficiently and moreover accurately even though the throughput capacity or the memory (ROM 49, flash memory 51 or the like) capacity of the CPU 53 is not so large.

Also, in the above examples, the present invention is applied to a program recording and reproducing apparatus which has a body separate from a display apparatus. However, the present invention is not restricted by this and can be applied also to a television receiver where a program recording and reproducing apparatus and a display apparatus are formed as one body configuration or a television receiver which does not have a recording and reproducing function of the program.

Also, in the above examples, the present invention is applied for searching a keyword from the title character string information of the program and detailed character string information in the EPG information. However, the present invention is not restricted by this and can be applied for searching a keyword from title character string information and detailed character string information of contents other than the television program (for example, contents delivered via

internet).

Also, it is needless to say that the present invention is not restricted by the above examples and other various kinds of constitutions can be taken without departing from the scope of the present invention.

As mentioned above, an effect is obtained according to the present invention such that it becomes possible for a user to extract a keyword for searching the program automatically, efficiently and moreover accurately from the title character string information and detailed character string information of the program such as EPG information even in home electric appliances in which the throughput capacity or the memory capacity of the CPU is not so large.